

IN THE CLAIMS:

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Please cancel claim 15, without prejudice.

REMARKS

Applicants respectfully request reconsideration of the present U.S. application. Claims 1-14 and 16-20 remain in the application. Claim 15 has been cancelled without prejudice. No claims have been amended or added. Thus, claims 1-14 and 16-20 remain pending. A petition for extension of time to extend the period for response one month, including the appropriate fee, is filed herewith.

A. 35 U.S.C. § 112

Claim 15 has been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants have cancelled claim 15. Therefore, reconsideration and withdrawal of the objection is respectfully requested.

B. 35 U.S.C. § 103(a)

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach

or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Wang in view of Ahn - Claims 1-8

Claims 1-8 stand rejected under 35 U.S.C. § 103(a) as being obvious over the U.S. Patent No. 6,291,887 issued September 18, 2001 to Fei Wang, et al. (hereinafter "the Wang patent") in combination with U.S. Patent Application Publication No. 0090806 A1 published July 11, 2002 to Kie Y. Ahn et al. (hereinafter "the Ahn publication") (Office Action, page 2). For at least the reasons set forth below, Applicants submit that the claims 1-8 are not rendered obvious by the Wang patent in view of Ahn.

With regard to claim 1, the Office relies on solely on the Wang patent (Col. 12, lines 20-32) for a teaching of "a first dielectric layer (diffusion barrier layer) and a nitride layer (etch stop) deposited on top, covered by another dielectric layer" (Office Action, page 3). However, the Wang patent teaches a first dielectric layer that is an interlayer dielectric layer (ILD), not a diffusion barrier layer.

The Wang patent teaches "a first dielectric layer comprising a low k dielectric material, a nitride layer formed on the first dielectric material, and a second low k dielectric layer formed on the nitride layer" (col 3, lines 24-27, see also FIG. 11). The "first dielectric layer 14" disclosed in the Wang patent is an interlayer dielectric (ILD) layer, wherein trench 26 is formed by etching through first dielectric layer 14 in order to deposit metal stud 30 as shown in Figs. 10 and 11. Here, the first dielectric layer 14 is provided to electrically isolate the stud 30 from other patterned conductive material layers located on the semiconductor device (see FIG. 11).

The Office contends that the first dielectric layer of the Wang patent is a diffusion barrier layer, which is not the same as an ILD layer. A diffusion barrier layer may be formed in a semiconductor structure in order to prevent diffusion of a conductive material into a dielectric layer (Description of Related Art section of the present invention at page 3, lines 17-19). However, the Wang patent teaches a "first dielectric layer" that insulates one conductive layer from another, and does not teach or suggest a "first dielectric layer" that prevents diffusion of a conductive material into a dielectric layer.

Claim 1 of the present invention discloses "a diffusion barrier layer disposed above and on the substrate, the diffusion barrier layer having a first thickness and a first dielectric constant." The Applicants disclose that "the diffusion barrier layer 16 has a greater tendency to resist the diffusion of copper or other metalization materials" (Detailed Description section of the current application at page 14, lines 3-5). Thus, the present invention teaches a diffusion barrier layer that provides resistance to the diffusion of conductive material.

"To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." In *re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). The Wang patent does not teach or suggest such a diffusion barrier layer as taught in claim 1 of the present invention. Thus, claim 1 is not rendered obvious by the Wang patent.

With regard to claim 2, the Office contends that while Wang does not disclose a specific thickness for the diffusion barrier layer, the Ahn publication discloses a similar structure with a thickness of about 2,000 to 15,000 Angstroms (page 5, 1st col., lines 34-36)", and it would have been obvious to utilize the claimed thickness under *In re Aller*. (Office Action, page 3). However, the structure relied upon by the examiner in the Ahn publication is a "first insulating

layer” (ILD layer) (page 5, 1st col., line 22), and not a diffusion barrier layer, and does not teach or suggest, either alone or in combination with Wang, the use of this insulating layer as a diffusion barrier layer as taught in claim 2 of the present invention. Thus, claim 2 is not rendered obvious by the Wang patent in view of Ahn.

With regard to claims 3 and 4, the Office cites the Wang patent (col. 8, lines 16-21, lines 44-46) for a teaching of “the first (diffusion layer) layer is a polymer (organic) and the etch stop layer is nitride (inorganic)” (Office Action, pages 3-4). However, the “first layer” relied upon by the examiner in the Wang patent is an ILD layer as described previously, and not a diffusion barrier layer, and as such does not teach or suggest, either alone or in combination with Ahn, the use of this insulating layer as a diffusion barrier layer as taught in claims 3 and 4 of the present invention. Thus, claims 3 and 4 are not rendered obvious by the Wang patent in view of Ahn.

With regard to claims 5 and 6, the Office contends that while Wang does not disclose an inorganic/organic stacking sequence, Ahn discloses that the first dielectric layer is inorganic and the etch stop is organic, and that it would have been obvious to obtain the claimed stacking sequence. However, the “first dielectric layer” relied upon by the examiner in the Wang patent is an (ILD) layer, and not a diffusion barrier layer, and as such does not teach or suggest, either alone or in combination with Wang, the use of this insulating layer as a diffusion barrier layer as taught in claims 5 and 6 of the present invention. Thus, claims 5 and 6 are not rendered obvious by the Wang patent in view of Ahn.

With regard to claims 7 and 8, the Office contends that although Ahn does not disclose a single damascene structure, it would have been obvious to alter the shape of the contact of the present invention to produce such a structure. Even though it may have been obvious to alter the

shape of the contact of the present invention, the structure cited by the examiner in the Ahn publication does not include a diffusion barrier layer, nor does it teach or suggest in combination with the Wang patent the use of such a diffusion barrier layer as taught in claim 1 of the present invention from which claims 7 and 8 depend. If an independent claim is nonobvious, then any claim depending from the independent claim is also nonobvious. *In re Fine*, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1998). Because dependent claims 7 and 8 depend from claim 1, Applicants submit that claims 7 and 8 are not rendered obvious by the Wang patent in view of Ahn.

Therefore, reconsideration and withdrawal of the Section 103(a) rejection of claims 1-8 are respectfully requested.

Ahn in view of Wang – Claims 9-20

Claims 9-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahn in view of Wang. In the Office Action's comment at page 5 regarding claim 9, the Office relies on the Ahn publication (page 5, lines 12-25; 34-36) for a teaching of "a first (diffusion layer) insulating layer, and a second insulating layer (etch stop)." (Office Action, page 5). The Ahn publication discloses a "first intermetal insulating layer 55)" (page 2, paragraph 0033) and does not teach or suggest the use of this insulating layer (ILD) as a diffusion barrier layer. The structure cited by the examiner in Ahn does not teach or suggest in combination with Wang the use of a diffusion barrier layer as in claim 9 of the present invention.

"To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Because the Ahn publication does not teach or suggest, either alone or in combination

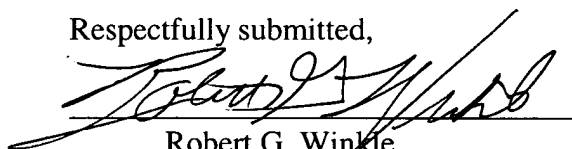
with the Wang patent, a diffusion barrier layer as taught in claim 9 of the present invention, claim 9 is not rendered obvious by the Ahn publication in view of Wang.

If an independent claim is nonobvious, then any claim depending from the independent claim is also nonobvious. *In re Fine*, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1998). Because dependent claims 10-20 depend from claim 9, Applicants submit that claims 10-20 are not rendered obvious by the Ahn publication in view of Wang. Therefore, reconsideration and withdrawal of the Section 103(a) rejection of claims 9-20 are respectfully requested.

In view of the foregoing remarks, the Applicants request allowance of the application. Please forward further communications to the address of record. If the Examiner needs to contact the below-signed attorney to further the prosecution of the application, the contact number is (503) 712-1682.

Dated: November 4, 2002

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Robert G. Winkle', is written over a horizontal line.

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